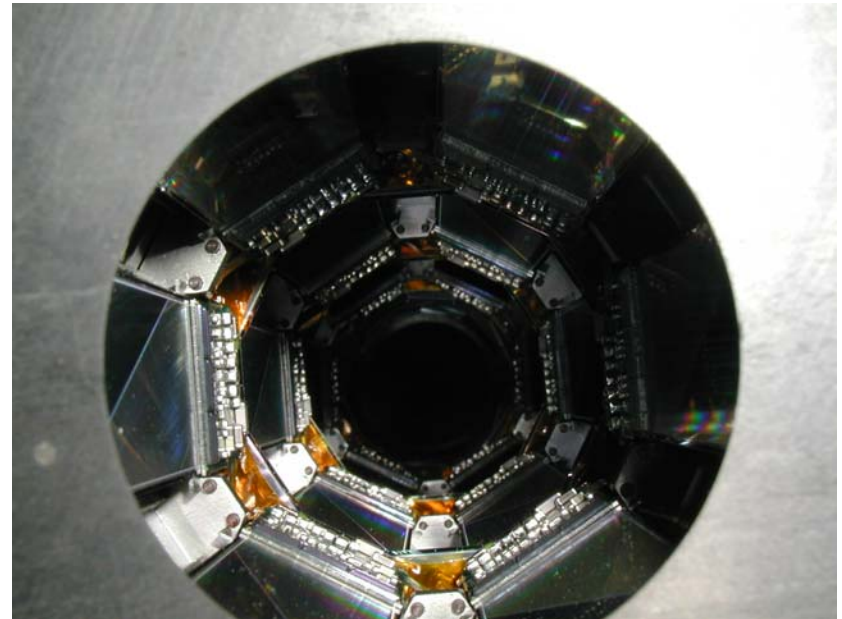# Layer 0

**We can build a inner detector that will fit into the current D0SMT**

- Improved pattern recognition
- Better impact parameter resolution
- we need to make compromises to fit into the available space

Should we build such a detector?

- It will significantly improve tracking performance
- It will make good use of the work invested in run2b
- It will not be nearly as good as the 2b detector – does the collaboration want to do it?

Ronald Lipton
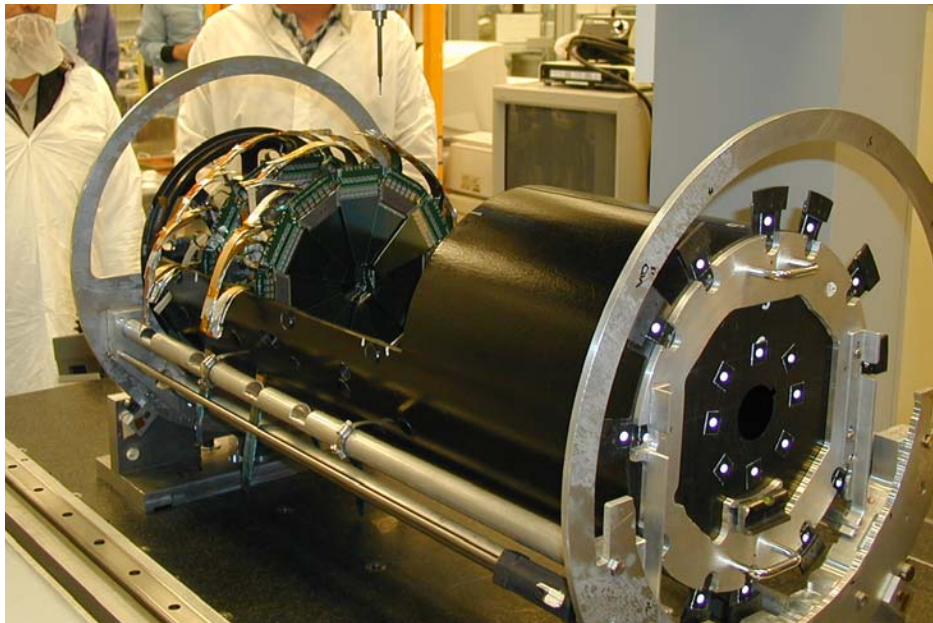
Layer 0 Design

- **Design – use as much of the Run2b R&D as possible**
- **Detector must fit in 22.8 mm SMT support structure opening**
  - ◆ **Six phi segments**
  - ◆ **Eight z segments 2x7,2x12 cm**
  - ◆ **Analog cables – low mass**
  - ◆ **48 HDIs x 256 channels**
  - ◆ **SVX4 chips (96)**
- **Use 2b Hybrids**
- **Use 2a infrastructure (new adapter cards)**
- **May have to limit z segmentation to gain space**


Ronald Lipton
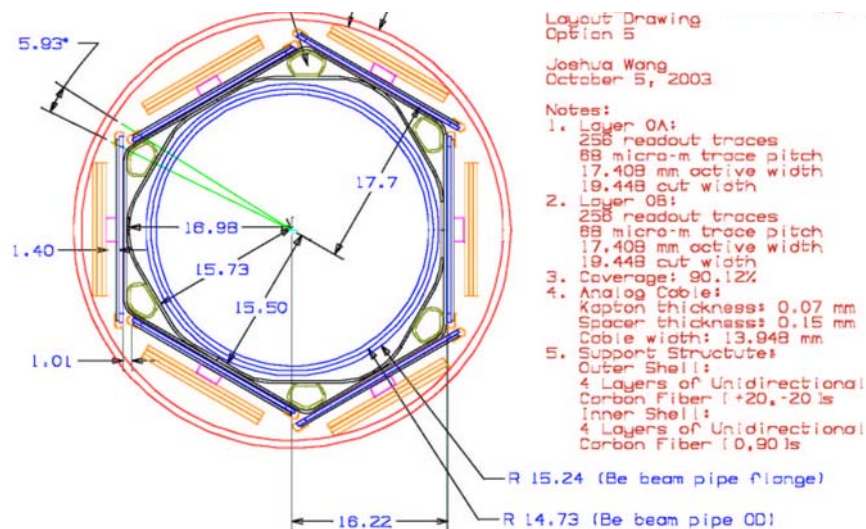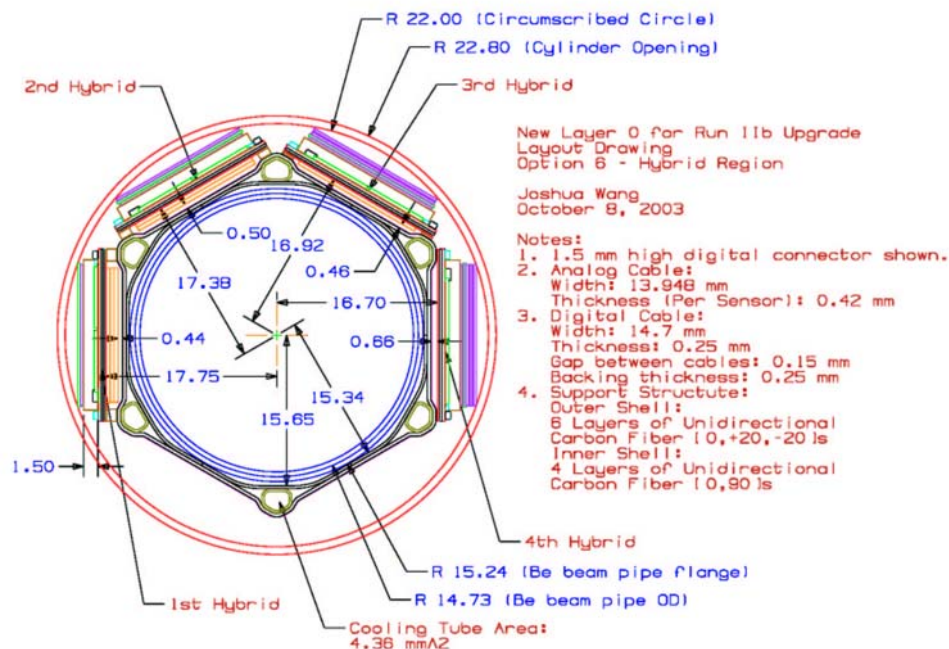
Layer 0 Performance

- **Shorter than 2b detector- matches 2a**
- **Good signal/noise with shorter analog cables, detectors ~15:1**
- **Larger range of incident angles**
  - **Wide, small signal clusters**
  - **Minimum s/n = 6.7**
- **Significant improvement in IP resolution – especially at low momentum**
- **Additional hit for pattern recognition, STT**
- **High occupancy**

	Z1	Z2	Z3	Z4
Detector length (cm)	7	7	12	12
Strip pitch (microns)	73	73	73	73
Active width (mm)	18.69	18.69	18.69	18.69
Radius (inner)	16.43	16.43	16.43	16.43
Max angle (radians)	0.52	0.52	0.52	0.52
L, effective (microns)	147.67	147.67	147.67	147.67
Analog cable length (cm	36	34	27	20
Total capacitance (pf)	21	20.3	23.85	21.4
Total noise(electrons)	1445	1414	1573	1463
S/N (normal inc)	15.9	16.3	14.6	15.7
S/N (edge)	7.3	7.5	6.7	7.3

Impact parameter resolution

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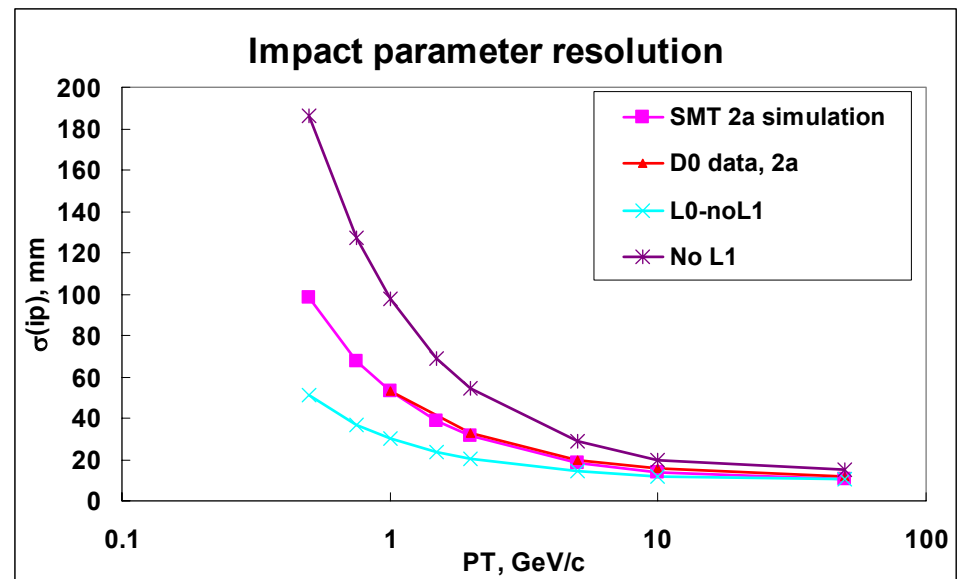
Layer 0 Status

COMPRESSED SCHEDULE:

Sept 25 – Design Workshop

Oct 9/10 – Presentation to collaboration/IB

Oct 14 – "Directors Review" of L0, Trigger, submit design document:

> "… provide a document that includes the motivation for layer 0, the design concept, some demonstration of the effectiveness, a first cost estimate and schedule, the feasibility of the installation plan, and a consideration of the risks. To make sure we are able to move through this process expeditiously, we would like such a document by about mid-October."
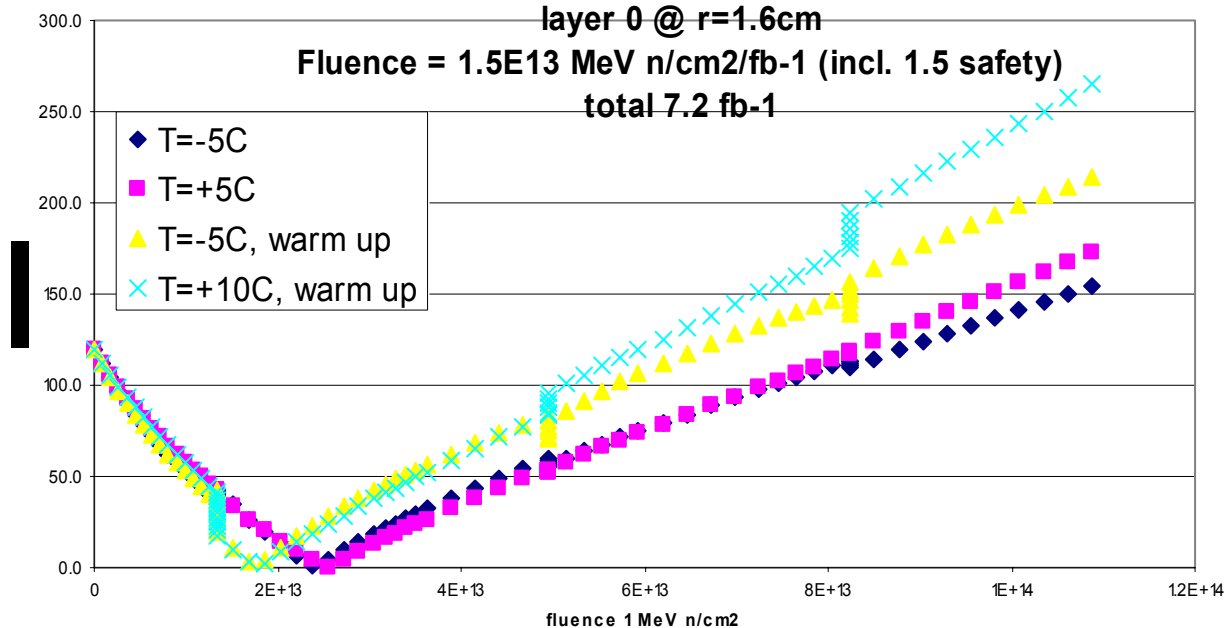
Nov 10 – Mini review

Nov 19 – Submission of revised baseline to DOE

Ronald Lipton

Layer 0 Performance

- **Phi coverage 90-95%**
- **Z coverage ~ +/- 38 cm**
- **Limited fluence – relaxed requirements on depletion voltage, operating temperature.**
- **Should be able to design for Vmax of ~300V – can use existing infrastructure**

Ronald Lipton

Layer 0 uncertainties

- ## Will it fit
  - ◆ Yes … but there is not much margin.
  - ◆ How much margin do we allow?
    - ▲ Baseine design is aggressive
      - – Go from 8 to 6 z segments to reduce cable stack
      - – Go to single ply analog cables to reduce stack
  - ◆ How much coverage?
    - ▲ 90-95% in phi depending on detector spacing tolerances
  - ◆ Conservative grounding scheme
    - ▲ Leave space between beam pipe and detector
    - ▲ Electrically isolate detector
    - ▲ Break N/S conductivity?
    - ▲ Isolate at adapter card
- ## All need decisions in weeks

Ronald Lipton

Layer 0 Project

People – This is an opportunity for the experiment and collaborators to utilize work done for 2b. Most 2b participants have indicated interest and some commitment, many at a reduced level. My impression is that there is commitment commensurate with the smaller scale of the project.

Cost and Schedule:

- **First pass schedule almost done**
  - ◆ **~1.5 year design/construction period**
  - ◆ **Need to detail mechanical design ASAP**
- **Costs**
  - ◆ **M&S ~ $1M, 50% spares, 100% contingency**
  - ◆ **Resources not yet loaded**
  - ◆ **Need to fold in MRI funding**
- **Define organization/responsibilities**

Ronald Lipton

Layer 0 conclusions

The chain of logic leading to this project has been called bizarre – it indeed is - 2b is clearly better, not much more expensive and needs less R&D

Nonetheless layer 0 will materially improve the performance of D0, may be crucial in recovering tracking as the 2a detector degrades.

We know how to do this, and have the resources and manpower – it is, as much as anything, a demonstration of the continued vitality of the experiment.

Ronald Lipton